

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A gas sensor for measuring the concentration of a specific gas component in a gas under measurement, comprising:
 - a gas diffusion rate limiting portion limiting the rate of diffusion of the gas under measurement;
 - a measurement chamber communicating with an atmosphere of the gas under measurement through the gas diffusion rate limiting portion;
 - a sensor element having an ion-conductive layer with first and second surfaces, a first electrode disposed in contact with the first surface of the ion-conductive layer within the measurement chamber, and a second electrode disposed in contact with the second surface of the ion-conductive layer and communicating exclusively with the atmosphere of the gas under measurement;
 - a cylindrical support member installing therein the sensor element with the first and second surfaces of the ion-conductive layer directed toward front and base end sides of the support member, respectively; and
 - a circuit for applying a voltage between the first and second electrodes to cause dissociation, decomposition or reaction of the specific gas component of the gas in the measurement chamber and thereby generates ions at the first electrode, allowing an electric current flow due to migration of the ions from the first electrode to the second electrode through

the ion-conductive layer, and determining the concentration of the specific component in the gas under measurement based on the electric current flow;

a gas introduction passage for introducing the gas from the atmosphere of the gas under measurement to the first electrode; and

a gas return passage for returning the gas drawn to the second electrode to the atmosphere of the gas under measurement, said gas return passage extending to the front end side of the support member.

2. (canceled).

3. (currently amended): A gas sensor according to Claim 21, wherein the gas introduction passage leads to the measurement chamber from the front end side of the support member.

4. (canceled).

5. (original): A gas sensor according to Claim 1, wherein the gas diffusion rate limiting portion is formed in the support member.

6. (original): A gas sensor according to Claim 1, further comprising a filter having water repellency and air permeability and arranged between the gas diffusion rate limiting portion and the atmosphere of the gas under measurement.

7. (original): A gas sensor according to Claim 1, wherein the ion-conductive layer is a proton-conductive layer so that the gas sensor measures the concentration of hydrogen in the gas under measurement.

8. (original): A gas sensor according to Claim 1, wherein the gas sensor is designed to be fixed to a pipe through which the gas under measurement flows.

9. (currently amended): A gas sensor for measuring the concentration of a specific gas component in a gas under measurement, comprising:

a gas diffusion rate limiting portion limiting the rate of diffusion of the gas under measurement;

a measurement chamber communicating with an atmosphere of the gas under measurement through the gas diffusion limiting portion;

a sensor element provided with an ion-conductive layer having first and second surfaces directed to front and base ends of the gas sensor, respectively, a first electrode disposed in contact with the first surface of the ion-conductive layer within the measurement chamber, and a second electrode disposed in contact with the second surface of the ion-conductive layer and communicating exclusively with the atmosphere of the gas under measurement:

first and second support members located on front and base end sides of the sensor element, respectively, to support the sensor element between the first and second support members; and

a circuit for applying a voltage between the first and second electrodes to cause dissociation, decomposition or reaction of the specific component of the gas in the measurement

chamber and thereby generate ions at the first electrode, allowing an electric current flow due to migration of the ions from the first electrode to the second electrode through the ion-conductive layer, and determining the concentration of the specific component in the gas under measurement based on the electric current flow;

a gas introduction passage for introducing the gas from the atmosphere of the gas under measurement to the first electrode; and

a gas return passage for returning the gas drawn to the second electrode to the atmosphere of the gas under measurement,

wherein the gas introduction passage has a gas introduction hole formed in the first support member such that the gas introduction passage leads to the measurement chamber from a front end side of the first support member.

10-11. (canceled).

12. (currently amended): A gas sensor according to ~~claim 10~~ claim 9, the gas return passage including:

a first gas return channel extending laterally outwardly in the second support member; and

a second gas return channel connected with the first gas return channel and extending to a front end side of the first support member.

13. (original): A gas sensor according to Claim 9, wherein the gas diffusion rate limiting portion is formed in the first support member.

14. (original): A gas sensor according Claim 9, wherein the first support member is formed into a cylindrical shape and installs therein the sensor element and optionally the second support member.

15. (original): A gas sensor according to Claim 9, wherein the first support member is mainly made of a ceramic material.

16. (original): A gas sensor according to Claim 15, wherein the first support member has an electrically conductive portion connected to the first electrode.

17. (canceled).

18. (original): A gas sensor according to Claim 9, further comprising an elastic member pushing the second support member and the sensor element to the first support member.

19. (original): A gas sensor according to Claim 9, further comprising a filter having water repellency and air permeability and arranged between the gas diffusion rate limiting portion and the atmosphere of the gas under measurement.

20. (original): A gas sensor according to Claim 9, wherein the ion-conductive layer is a proton-conductive layer so that the gas sensor measures the concentration of hydrogen in the gas under measurement.

21. (original): A gas sensor according to Claim 9, wherein the gas sensor is designed to be fixed to a pipe through which the gas under measurement flows.

22. (currently amended): A gas sensor for measuring the concentration of a specific gas component in a gas under measurement, comprising:

a gas diffusion rate limiting portion limiting the rate of diffusion of the gas under measurement;

a measurement chamber communicating with an atmosphere of the gas under measurement through the gas diffusion limiting portion;

a sensor element having an ion-conductive layer with first and second surfaces, a first electrode disposed in contact with the first surface of the ion-conductive layer within the measurement chamber, and a second electrode disposed in contact with the second surface of the ion-conductive layer and communicating exclusively with the atmosphere of the gas under measurement:

means for supporting the sensor element in such a manner the first and second surface of the ion-conductive layer are directed toward front and base ends of the gas sensor, respectively;

and

a circuit for applying a voltage between the first and second electrodes to cause dissociation, decomposition or reaction of the specific component of the gas in the measurement chamber and thereby generate ions at the first electrode, allowing an electric current flow due to migration of the ions from the first electrode to the second electrode through the ion-conductive

layer, and determining the concentration of the specific component in the gas under measurement based on the electric current flow;

a gas introduction passage for introducing the gas from the atmosphere of the gas under measurement to the first electrode; and

a gas return passage for returning the gas drawn to the second electrode to the atmosphere of the gas under measurement, said gas return passage extending to the front end side of the supporting means.

23. (original): A gas sensor according to Claim 22, wherein the gas sensor is designed to be fixed to a pipe through which the gas under measurement flows.

24. (new): A gas sensor for measuring the concentration of a specific gas component in a gas under measurement, comprising:

a gas diffusion rate limiting portion limiting the rate of diffusion of the gas under measurement;

a measurement chamber communicating with an atmosphere of the gas under measurement through the gas diffusion limiting portion;

a sensor element provided with an ion-conductive layer having first and second surfaces directed to front and base ends of the gas sensor, respectively, a first electrode disposed in contact with the first surface of the ion-conductive layer within the measurement chamber, and a second electrode disposed in contact with the second surface of the ion-conductive layer and communicating exclusively with the atmosphere of the gas under measurement;

first and second support members located on front and base end sides of the sensor element, respectively, to support the sensor element between the first and second support members; and

a circuit for applying a voltage between the first and second electrodes to cause dissociation, decomposition or reaction of the specific component of the gas in the measurement chamber and thereby generate ions at the first electrode, allowing an electric current flow due to migration of the ions from the first electrode to the second electrode through the ion-conductive layer, and determining the concentration of the specific component in the gas under measurement based on the electric current flow,

the second support member having:

at least two ceramic layers laminated to each other;

a front end electrode arranged at a front end side of the second support member;

a base end electrode arranged at a base end side of the second support member;

at least one electrically conductive layer, each of which is arranged between adjacent two of the ceramic layers; and

through holes formed in the respective ceramic layers so as to allow offset therebetween and to provide electrical connection between the front and base end electrodes through said at least electrically conductive layer.